7.4 Content for Stage 2

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Mathematics • Stage 2

Number and Algebra
Whole Numbers 1

Outcomes
A student:
2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas
2.2 selects and uses appropriate mental, written or technological strategies to solve problems
2.3 explains the reasoning used to check the accuracy of a statement
2.4 counts, records and uses numbers in mental and written strategies involving the four operations

Students:

Recognise, model, represent and order numbers to at least $10\,000$

- represent numbers up to four digits using numerals, words, objects and digital displays [N] [L]
  - make the largest and smallest number from four given digits (Understanding, Fluency) [N] [CCT]
- identify the number before and after a given two-, three- or four-digit number [N]
- order a set of four-digit numbers in ascending or descending order [N]
  - use place value to compare and explain the relative size of four-digit numbers (Reasoning, Understanding) [N] [CCT]
- use the symbols for 'is less than' $(<)$ and 'is greater than' $(>)$ to show the relationship between two numbers [N] [L]

Apply place value to partition, rearrange and regroup numbers to at least $10\,000$ to assist calculations and solve problems

- apply an understanding of place value and the role of zero to read, write and order numbers up to four digits [N] [L]
  - interpret four-digit numbers used in everyday contexts (Understanding) [N]
- write and solve a variety of problems with four-digit numbers (Problem Solving) [N]
  - choose an appropriate strategy to solve problems, including trial and error, drawing a diagram, working backwards, looking for patterns and using a table (Fluency) [CCT]
- state the place value of digits in two-, three- or four-digit numbers [N], eg 'in the number 3426, the 3 represents 3000 or 3 thousands'
- count forwards and backwards by tens or hundreds on and off the decade [N], eg $1220, 1230, 1240, \ldots$ (on the decade), $423, 323, 223, \ldots$ (off the decade)
- record numbers up to four digits using expanded notation [N], eg $5429 = 5000 + 400 + 20 + 9$

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Number and Algebra
Whole Numbers 1

- use standard decomposition of four-digit numbers [N],
  eg 3265 as three groups of 1000, 2 groups of 100, six groups of 10 and five ones
- use a variety of non-standard decomposition of four-digit numbers [N] [CCT],
  eg 3265 can be 32 hundreds, and 65 ones
- round numbers to the nearest ten, hundred or thousand when estimating [N]

Background Information:

Students should be encouraged to develop different counting strategies, eg if they are counting a large number of shells they can count out groups of ten and then count the groups.

The place value of digits in various numerals is investigated. Students should understand, for example, that the five in 35 represents five ones but the 5 in 53 represents five tens.

Language:

The word ‘and’ is used between the hundreds and the tens when reading a number, but not between other places, eg three thousand, six hundred and sixty-three.

The word ‘round’ has different meanings in different contexts, eg ‘the plate is round’, ‘round 23 to the nearest ten’.

The word ‘place’ has different meanings in everyday language to those used in a mathematical context.

Mathematics • Stage 2

Number and Algebra
Whole Numbers 2

Outcomes
A student:

2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas
2.2 selects and uses appropriate mental, written or technological strategies to solve problems
2.3 explains the reasoning used to check the accuracy of a statement
2.4 counts, records and uses numbers in mental and written strategies involving the four operations

Students:

Recognise, represent and order numbers to at least tens of thousands

- order numbers of any size in ascending or descending order [N]

Apply place value to partition, rearrange and regroup numbers to at least tens of thousands to assist calculations and solve problems

- state the place value of any digit in large numbers [N] [L]
  - pose and answer questions that extend understanding of numbers, eg ‘What happens if I rearrange the digits in the number 12340?’, eg ‘How can I rearrange the digits to make the smallest number?’ (Understanding, Reasoning) [N] [CCT]
- record large numbers using expanded notation, eg $59675 = 50000 + 9000 + 600 + 70 + 5$ [N]
- uses standard decomposition of numbers of any size [N]
- use a variety of non-standard decomposition of numbers of any size [N] [CCT]
- write and solve a variety of problems with whole numbers of any size (Problem Solving) [N] [CCT]
  - choose an appropriate strategy to solve problems, including trial and error, drawing a diagram, working backwards, looking for patterns and using a table (Fluency) [CCT]
- round numbers appropriately when estimating [N]

Background Information:

The convention for writing numbers of more than four digits requires that they have a space (and not a comma) to the left of each group of three digits, when counting from the units column.

Language:

Refer to language in Whole Numbers 1

Mathematics • Stage 2

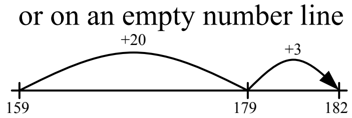
Number and Algebra
Addition and Subtraction 1

Outcomes
A student:
2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas
2.2 selects and uses appropriate mental, written or technological strategies to solve problems
2.4 counts, records and uses numbers in mental and written strategies involving the four operations

Students:

Recall addition facts for single-digit numbers and related subtraction facts to develop increasingly efficient mental strategies for computation

- apply known single-digit addition and subtraction facts to solve more complex problems [N] [CCT]
  - choose efficient strategies for addition and subtraction, including:
    - the jump strategy, eg $23+35$; $23+30$ is 53, $53+5=58$
    - the split strategy, eg $23+35$; $20+30+3+5$ is 58
    - the compensation strategy, eg $63+29$; $63+30$ is 93, subtract 1 to obtain 92
    - using patterns to extend number facts, eg $500-200$; since $5-2=3$, so $500-200$ is 300
    - bridging the decades, eg $34+26$; $34+6$ is 40, $40+20$ is 60
    - changing the order of addends to form multiples of 10, eg $16+8+4$; add 16 to 4 first (Fluency) [N] [CCT]
- record mental strategies, eg $159+23$; 'I added 20 to 159 to get 179, then I added 3 more to get 182.' or on an empty number line [L]



- use mental, written or calculator methods to solve a variety of problems [N] [CCT]

Recognise and explain the connection between addition and subtraction

- add and subtract two or more numbers, with and without trading, using concrete materials and recording their method [N]
- give a reasonable estimate for a problem, explain how the estimate was obtained and check the solution (Problem Solving) [N] [L]
- use a formal written algorithm and apply place value to solve addition and subtraction problems, involving two-, three- and four-digit numbers [L]
- explain and check solutions using the inverse operation or a different method (Problem Solving) [CCT]
- use a calculator to generate number patterns, using addition and subtraction

Represent money values in multiple ways and count the change required for simple transactions to the nearest five cents

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Number and Algebra
Addition and Subtraction 1

- perform simple calculations with money including finding change and rounding to the nearest 5 cents [N] [PSC]
- recognise equivalent amounts of money using different denominations, eg 50 cents can be made up of two 20 cent coins and a 10 cent coin [N] [PSC]

Background Information:

Students should be encouraged to estimate answers before attempting to solve problems in concrete or symbolic form. There is still a need to emphasise mental computation even though students can now use a formal written method. The following formal method may be used.

Decomposition

The following example shows a suitable layout for the decomposition method.

$$\begin{array}{r} 2\ \overset{3}{\not{4}}\ {}^{1}5\ 6\ - \\ \underline{1\ 3\ 8\ 5} \\ \underline{1\ 0\ 7\ 1} \end{array}$$

When developing a formal written algorithm, it will be necessary to sequence the examples to cover the range of possibilities that include with and without trading in one or more places, and one or more zeros in the first number.

Language:

Word problems requiring subtraction usually fall into two types − either ‘take away’ or ‘comparison’. The comparison type of subtraction involves finding how many more need to be added to a group to make it equivalent to a second group, or finding the difference between two groups. Students need to be able to translate from these different language contexts into a subtraction calculation. The word ‘difference’ has a specific meaning in a subtraction context. Difficulties could arise for some students with phrasing in relation to subtraction problems, eg ‘10 take away 9’ will give a different response to ‘10 was taken away from 9’.

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Number and Algebra

Addition and Subtraction 2

Outcomes

A student:

2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas

2.3 explains the reasoning used to check the accuracy of a statement

2.4 counts, records and uses numbers in mental and written strategies involving the four operations

Students:

Solve problems involving purchases and the calculation of change to the nearest five cents with and without digital technologies

- pose problems that can be solved using addition and subtraction, including those involving money [CCT]
  - reflect on own method of solution for a money problem, considering whether it can be improved (Reasoning) [CCT]
- use estimation to check solutions to addition and subtraction problems, including those involving money [N]

Use a formal written algorithm for addition and subtraction

- use a formal written algorithm and apply place value to record addition and subtraction calculations, involving two-, three- and four-digit numbers,

  eg $\begin{array}{r} 134 \\ \underline{253}+ \\ \underline{\quad\quad} \end{array}$ $\begin{array}{r} 2459 \\ \underline{138}+ \\ \underline{\quad\quad} \end{array}$ $\begin{array}{r} 568 \\ \underline{322}- \\ \underline{\quad\quad} \end{array}$ $\begin{array}{r} 1353 \\ \underline{168}- \\ \underline{\quad\quad} \end{array}$ [L]

Background Information:

Refer to background information in Addition and Subtraction 1

Language:

Refer to language in Addition and Subtraction 1

Mathematics • Stage 2

Number and Algebra
Multiplication and Division 1

Outcomes
A student:
2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas
2.2 selects and uses appropriate mental, written or technological strategies to solve problems
2.3 explains the reasoning used to check the accuracy of a statement
2.4 counts, records and uses numbers in mental and written strategies involving the four operations

Students:

Recall multiplication facts of two, three, five and ten and related division facts

- count by twos, threes, fives or tens using skip counting [N]
- link multiplication and division facts using groups or arrays,

  eg
  •••• 3 rows of 4 is 12 $3\times4=12$
  •••• 3 groups of 4 is 12 $3\times4=12$
  •••• 12 shared among 3 is 4 $12\div3=4$ [N] [CCT] [L]

- explain why a rectangular array can be read as a division in two ways by forming vertical or horizontal groups, eg $12\div4=3$ or $12\div3=4$ [L] [CCT] [N]
- recognise and use $\div$ to indicate division [L]

Investigate number sequences involving multiples of 3, 4, 6, 7, 8, and 9

- count by threes, fours, sixes, sevens, eights or nines using skip counting [N]

Represent and solve problems involving multiplication using efficient mental and written strategies and appropriate digital technologies

- use mental strategies to multiply a one-digit number by a multiple of 10, including
  - repeated addition, eg 3×20 ; $20+20+20=60$
  - using place value concepts, eg 3×20 ; $3\times2\,\text{tens}=6\,\text{tens}=60$
  - factoring, eg 3×20 ; $3\times2\times10=6\times10=60$ [N]
  - apply the inverse relationship of multiplication and division to justify answers, eg $20\div5$ is 4 because $4\times5=20$ (Reasoning) [CCT] [N]
- pose and solve problems using mental, written and calculator strategies, eg ‘to multiply by 12, multiply by 6 and then double’ (Fluency, Problem Solving) [CCT] [N]
  - explain how an answer was obtained and compare own method/s of solution to a problem with those of others (Understanding, Reasoning) [CCT] [N]
- describe and record methods used in solving multiplication and division problems [L]

Mathematics • Stage 2

Number and Algebra
Multiplication and Division 1

Background Information:

At this Stage, the emphasis in multiplication and division is on students developing mental strategies and using their own (informal) methods for recording their strategies. Comparing their method of solution with those of others, will lead to the identification of efficient mental and written strategies. One problem may have several acceptable methods of solution.

Students could extend their recall of number facts beyond the multiplication facts to 10×10 by also memorising multiples of numbers such as 11, 12, 15, 20 and 25.

Language:

When beginning to build and read multiplication facts aloud, it is best to use a language pattern of words that relates back to concrete materials such as arrays. As students become more confident with recalling multiplication number facts, they may use less language. For example, 'seven rows (or groups) of three' becomes 'seven threes' with the 'rows of' or 'groups of' implied. This then leads to: one three is three, two threes are six, three threes are nine, and so on.

Mathematics • Stage 2

Number and Algebra
Multiplication and Division 2

Outcomes
A student:
2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas
2.2 selects and uses appropriate mental, written or technological strategies to solve problems
2.3 explains the reasoning used to check the accuracy of a statement
2.4 counts, records and uses numbers in mental and written strategies involving the four operations

Students:

Recall multiplication facts up to 10×10 and related division facts

- recall multiplication facts up to 10×10, including zero facts [N]
- use mental strategies to recall multiplication facts up to 10×10, including
  - the commutative property of multiplication, eg $7\times9=9\times7$
  - using known facts to work out unknown facts, eg 5×7 is 35, so 6×7 is 7 more, which is 42
  - the relationship between multiplication facts, eg 5×8; double 5, double again and double again [N] [CCT]
- describe multiplication as the product of two or more numbers [L]
- list multiples for a given number [N]
- determine factors for a given number, eg factors of 12 are $1,2,3,4,6,12$ [N]
  - apply factorisation of a number to aid mental computation, eg $12\times25=3\times4\times25=3\times100=300$ (Fluency) [N]
  - use multiplication and division facts in board, card and computer games (Fluency) [N]
- find square numbers using concrete materials and diagrams [CCT]
  - explain why the numbers $1,4,9,16,\ldots$ are called square numbers (Reasoning) [L]

Develop efficient mental and written strategies and use appropriate digital technologies for multiplication and for division where there is no remainder

- use mental and written strategies to multiply a two-digit number by a one-digit number, including
  - using known facts, eg $10\times9=90$ so $13\times9=90+9+9+9=90+27=117$
  - multiplying the tens and then the units, eg 7×19; 7 tens plus 7 nines is 70 plus 63 which makes 133
  - the relationship between multiplication facts, eg 23×4 is double 23 and double again
  - factorising, eg $18\times5=9\times2\times5=9\times10=90$ [N]
  - create a table or simple spreadsheet to record multiplication facts, eg a 10×10 grid showing multiplication relationships (Fluency) [N] [ICT]

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Number and Algebra
Multiplication and Division 2

- use mental and written strategies to divide by a one-digit number, including
  - the inverse relationship of multiplication and division, eg $63 \div 9 = 7$ because $7 \times 9 = 63$
  - recalling known division facts
  - relating to known division facts, eg $36 \div 4$; halve 36 and halve again [N]

  – apply the inverse relationship of multiplication and division to justify answers, eg $63 \div 9$ is 7 because 7×9 is 63 (Reasoning) [CCT] [N]

- recognise and use $\div$ and $\overline{)\quad}$ to indicate division [L]

Solve word problems by using number sentences involving multiplication or division where there is no remainder

- pose and solve problems using mental, written and calculator strategies, eg ‘to multiply by 12, multiply by 6 and then double’ (Problem Solving) [N] [CCT]

  – explain how an answer was obtained and compare own method/s of solution to a problem with those of others (Understanding, Reasoning,) [CCT]

Use mental strategies and informal recording methods for division with remainders

- use mental strategies to divide by a one-digit number, in problems for which answers include a remainder, eg $29 \div 6$; if $4 \times 6 = 24$ and $5 \times 6 = 30$ the answer is 4 remainder 5 [N]

  – explain why a remainder is obtained in answers to some division problems (Reasoning) [CCT]

- record remainders to division problems, eg $17 \div 4 = 4$ remainder 1 [L]
- record answers, which include a remainder, to division problems to show the connection with multiplication, eg $17 = 4 \times 4 + 1$ [L]
- interpret the remainder in the context of the word problem [L] [CCT]

Background Information:

Linking multiplication and division is an important understanding for students at this Stage. Students should come to realise that division ‘undoes’ multiplication and multiplication ‘undoes’ division. Students should be encouraged to check the answer to a division question by multiplying their answer by the divisor. To divide, students may recall division facts or transform the division into a multiplication and use multiplication facts, eg $35 \div 7$ is the same as $\square \times 7 = 35$.

Language:

The term ‘product’ has a different meaning in mathematics from its everyday usage.

Mathematics • Stage 2

Number and Algebra

Fractions and Decimals 1

Outcomes

A student:

2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas

2.3 explains the reasoning used to check the accuracy of a statement

2.5 represents commonly used fractions and decimals

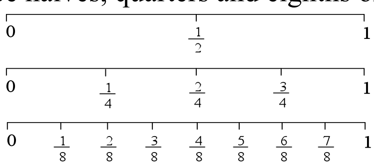
Students:

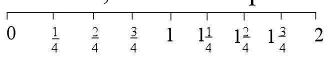
Model and represent unit fractions including $\frac{1}{2}, \frac{1}{4}, \frac{1}{3}, \frac{1}{5}$ and their multiples to a complete whole

- model, compare and represent fractions with denominators 2, 3, 4, 5 and 8 including
  - modelling simple fractions of a whole object or collection of objects
  - naming fractions up to one whole, eg $\frac{1}{4}, \frac{2}{4}, \frac{3}{4}, \frac{4}{4}$
  - ordering fractions with the same denominator
  - interpreting the denominator as the number of equal parts a whole has been divided into
  - interpreting the numerator as the number of equal fractional parts, eg $\frac{3}{8}$ means 3 equal parts of 8
  - comparing unit fractions by referring to the denominator or diagrams, eg $\frac{1}{8}$ is less than $\frac{1}{2}$
  - renaming $\frac{2}{2}, \frac{4}{4}, \frac{8}{8}$ as 1 [L] [N]

– explain why $\frac{1}{8}$ is less than $\frac{1}{4}$
eg if a cake is divided among eight people, the slices are smaller than if the cake is shared among four people (Reasoning) [CCT]

Count by quarters halves and thirds, including with mixed numerals. Locate and represent these fractions on a number line

- count and order fractions on a number line including
  - place halves, quarters and eighths on a number line between 0 and 1,
    eg 

  - count by halves, thirds and quarters, eg $0, \frac{1}{2}, 1, 1\frac{1}{2}, 2, \ldots$ or $0, \frac{1}{3}, \frac{2}{3}, 1, 1\frac{1}{3}, 1\frac{2}{3}, 2,$
  - place halves, thirds and quarters on a number line beyond 1,
    eg 

[L] [N]

Mathematics • Stage 2

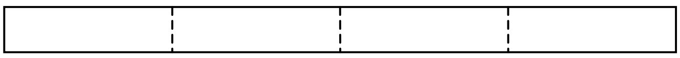
Number and Algebra
Fractions and Decimals 1

Background Information:

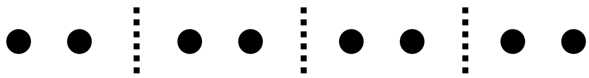
At this Stage, 'commonly used fractions' refers to those with denominators 2, 3, 4 and 8, as well as those with denominators 5, 10 and 100. Students apply their understanding of fractions with denominators 2, 3, 4 and 8 to fractions with denominators 5, 10 and 100. Fractions are used in different ways: to describe equal parts of a whole, to describe equal parts of a collection of objects and to denote numbers (eg $\frac{1}{2}$ is midway between 0 and 1 on the number line), as operators related to division (eg dividing a number in half).

Three Models of Fractions

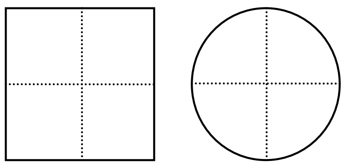
Linear Model – uses one directional cuts or folds that compare fractional parts based on length; this model should be introduced first.



Discrete Model – uses separate items in collections to represent parts of the whole group.



Area Model – uses multi-directional cuts or folds that compares fractional parts to the whole. This model should only be introduced once students have an understanding of the concept of area; generally to be introduced in Stage 2.



Language:

At this Stage students need to recognise that in English the term 'one third' is used (order: numerator, denominator) but that in other languages this concept may be expressed as 'three parts, one of them' (order: denominator, numerator), for example, Japanese.

Mathematics • Stage 2

Number and Algebra
Fractions and Decimals 2

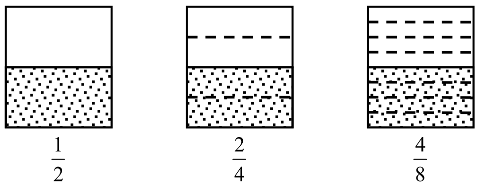
Outcomes
A student:
2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas
2.5 represents commonly used fractions and decimals

Students:

Investigate equivalent fractions used in contexts

- model, compare and represent fractions with denominators 2, 4, and 8 by finding equivalence between halves, quarters and eighths using concrete materials and diagrams, by re-dividing the unit [L] [N],

eg



- model, compare and represent fractions with denominators 3 and 6 [L] [N]
- model, compare and represent fractions with denominators 5, 10 and 100 by extending knowledge and skills to fifths, tenths and hundredths [L] [N]

Recognise that the place value system can be extended to tenths and hundredths. Make connections between fractions and decimal notation

- apply an understanding of place value to express whole numbers, tenths and hundredths as decimals
- recognise decimal notation for tenths and hundredths, eg 0.1 is the same as $\frac{1}{10}$ [L]
  - investigate equivalences using various methods, eg use a number line or calculator to show that $\frac{1}{2}$ is the same as 0.5 and $\frac{5}{10}$ (Understanding) [CCT]
  - interpret the everyday use of fractions and decimals, such as in advertisements (Understanding) [L] [CCT] [N]
- model, compare and represent decimals to two decimal places [L] [N]
  - apply decimal knowledge to record measurements, eg $123 \text{ cm} = 1.23 \text{ m}$ (Understanding) [N]
  - use a calculator to create patterns involving decimal numbers, eg $1 \div 10$, $2 \div 10$, $3 \div 10$ (Fluency)
- order decimals with up to 2 decimal places on a number line, such as $0.5, 0.25, 0.75$ [N]
- round a number with one or two decimal places to the nearest whole number [N]
  - round an answer obtained by using a calculator to one or two decimal places (Fluency) [N]

Mathematics • Stage 2

Number and Algebra
Fractions and Decimals 2

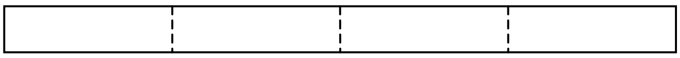
Background Information:

Money is an application of decimals to two decimal places.

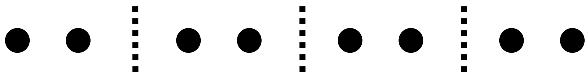
At this Stage it is not intended that students necessarily use the terms ‘numerator’ and ‘denominator’.

Three Models of Fractions

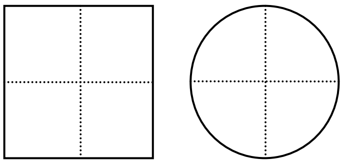
Linear Model- uses one directional cuts or folds that compare fractional parts based on length; this model should be introduced first.



Discrete Model- uses separate items in collections to represent parts of the whole group.



Area Model- uses multi-directional cuts or folds that compares fractional parts to the whole. This model should only be introduced once students have an understanding of the concept of area; generally to be introduced in Stage 2.



Language:

The decimal 1.12 is read ‘one point one two’ and not ‘one point twelve’.

Mathematics • Stage 2

Number and Algebra
Patterns and Algebra 1

Outcomes
A student:
2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas
2.6 generates number patterns and completes simple number sentences by calculating missing values

Students:

Describe, continue, and create number patterns resulting from performing addition or subtraction

- identify and describe patterns when counting forwards or backwards by threes, fours, sixes, sevens, eights or nines [CCT]
- model and then record number patterns using diagrams, words or symbols (Fluency, Understanding) [L]
- describe a simple number pattern in words [L]
  - ask questions about how number patterns have been created and how they can be continued (Understanding) [L] [CCT]
- create, with materials or a calculator, a variety of number patterns that increase or decrease, and describe them in more than one way, eg 42, 39, 36,… [L]
  - generate number patterns using the process of repeatedly adding the same number on a calculator (Fluency)

Investigate the conditions required for a number to be odd or even and identify odd and even numbers

- recognise and explain number patterns, eg odds and evens, numbers ending with five [L]
- model odd and even numbers using arrays and other collection-based diagrams [L]

Background Information:

At this Stage students explore patterns using odd and even numbers. The concept of an odd number as being an even number with a ‘left over’ is a precursor to understanding remainders in multiplication and division, and the concept of equal grouping.

Mathematics • Stage 2

Number and Algebra
Patterns and Algebra 2

Outcomes
A student:
2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas
2.2 selects and uses appropriate mental, written or technological strategies to solve problems
2.3 explains the reasoning used to check the accuracy of a statement
2.6 generates number patterns and completes simple number sentences by calculating missing values

Students:

Use equivalent number sentences involving addition and subtraction to find unknown quantities

- apply the associative property of addition and multiplication to aid mental computation, eg $2+3+8=2+8+3=10+3=13$; $2\times3\times5=2\times5\times3=10\times3=30$ [N]
- complete number sentences involving one operation by calculating missing values, eg find $\square$ so that $5+\square=13$; find $\square$ so that $28=\square\times7$ [N]
  - check number sentences to determine if they are true or false, and, if false, explain why (Reasoning) [L] [CCT] [N]
  - justify a solution to a number sentence (Reasoning) [CCT]
  - use inverse operations to complete number sentences (Fluency) [CCT]
  - check solutions to missing elements in patterns by repeating the process (Fluency, Reasoning)

Investigate and use the properties of odd and even numbers

- use knowledge of odd and even numbers to create and continue patterns, eg play ‘guess my rule’ games such as ‘$1, 4, 7, \ldots$: what is the rule?’ [CCT] [N]

Explore and describe number patterns resulting from performing multiplication

- find a higher term in a number pattern given the first five terms, eg determine the 10th term given a number pattern beginning with $4, 8, 12, 16, 20, \ldots$ [N]
- use the equals sign to record equivalent number relationships and to mean ‘is the same as’ rather than as an indication to perform an operation, eg $4\times3=6\times2$ [L] [N]
- build the multiplication facts to at least 10 × 10 by recognising and describing patterns and applying the commutative property, eg $6\times4=4\times6$ [N]
  - make generalisations about numbers and number relationships, eg ‘It doesn’t matter what order you multiply two numbers because the answer is always the same.’ (Reasoning) [N] [CCT]
- form arrays using materials to demonstrate multiplication patterns and relationships

  eg $3\times5=15$
  • • • • •
  • • • • •
  • • • • •
  [N] [CCT]
- relate multiplication and division facts, eg $6\times4=24$; so $24\div4=6$ and $24\div6=4$ [N]

Mathematics • Stage 2

Number and Algebra
Patterns and Algebra 2

- transform a division calculation into a multiplication problem, eg find $\square$ so that $30 \div 6 = \square$ becomes find $\square$ so that $\square \times 6 = 30$ [N] [CCT]
- pose and solve problems based on number patterns (Problem Solving) [CCT] [N]

Background Information:

At this Stage the investigation of odd and even numbers leads to understanding what happens to numbers when they are added together or multiplied together. For example, 'an odd number added to an even number always results in an odd number', 'an even number multiplied by an even number always results in an even number.'

Mathematics • Stage 2

Measurement and Geometry

Length 1

Outcomes

A student:

2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas

2.3 explains the reasoning used to check the accuracy of a statement

2.7 calculates lengths, areas, volumes, capacities and masses using formal units

Students:

Measure, order and compare objects using familiar metric units of length, mass and capacity

- describe one centimetre as one hundredth of a metre [N]
- estimate, measure, order and compare lengths or distances using metres and centimetres
  - explain strategies used to estimate lengths or distances, eg by referring to a known length (Understanding) [CCT]
  - explain the relationship between the size of a unit and the number of units needed, eg more centimetres than metres will be needed to measure the same length (Understanding, Reasoning) [N] [CCT]
- record lengths or distances using metres and centimetres, eg 1 m 25 cm [N]
- recognise the need for a smaller unit than the centimetre
- recognise that ten millimetres equal one centimetre and describe one millimetre as one tenth of a centimetre [N]
- use the abbreviation for millimetre (mm) [L]
- record lengths or distances using centimetres and millimetres, eg 5 cm 3 mm [N]
  - describe how a length or distance was measured (Understanding) [N]

Background Information:

At this Stage, measurement experiences enable students to develop an understanding of the size of the metre, centimetre and millimetre, estimate and measure using these units, and select the appropriate unit and measuring device.

Mathematics • Stage 2

Measurement and Geometry
Length 2

Outcomes
A student:
2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas
2.3 explains the reasoning used to check the accuracy of a statement
2.7 calculates lengths, areas, volumes, capacities and masses using formal units

Students:

Use scaled instruments to measure and compare lengths, masses, capacities and temperatures

- convert between metres and centimetres, and centimetres and millimetres [N]
- estimate, measure and compare lengths or distances using millimetres [N]
- record lengths or distances using decimal notation to two decimal places, eg 1.25 m [N]
- recognise the features of an object associated with length, that can be measured, eg length, breadth, height, perimeter [N]
- use the term 'perimeter' to describe the total distance around a shape [L]
- estimate and measure the perimeter of two-dimensional shapes [N]
- use a tape measure, ruler or trundle wheel to measure lengths or distances [N]
  - select and use an appropriate device to measure lengths or distances (Fluency) [CCT]
  - question and explain why two students may obtain different measures for the same length, distance or perimeter (Understanding, Reasoning) [N] [CCT]

Background Information:

It is important that students have a clear understanding of the distinction between perimeter and area. For example, use rectangles that are blank inside when calculating perimeter. If there is no distinction between the visual representation of the rectangles in questions or problems, students will often just add the side lengths regardless of what the question has asked them to do.

Language:

'Perimeter' comes from the Greek words that means to measure around the outside.

Mathematics • Stage 2

Measurement and Geometry
Area 1

Outcomes
A student:
2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas
2.3 explains the reasoning used to check the accuracy of a statement
2.7 calculates lengths, areas, volumes, capacities and masses using formal units

Students:

Compare the areas of regular and irregular shapes by informal means

- recognise, discuss and compare areas using mathematical terms, eg 'smaller than', 'about the same as' and 'bigger than' a square metre [L]
- compare areas of rectangles and squares of various sizes using uniform tiles, eg 5 cm $\times$ 5 cm or 10 cm $\times$ 10 cm square tiles [N] [L]
- measure areas of irregular shapes involving partial areas using tiles, eg 'I have four half tiles, which is the same as two whole tiles' [N] [L]
  - explain why two students may obtain different measurements for the same area (Understanding, Reasoning) [N] [CCT]
  - discuss and compare areas using some mathematical terms (Understanding, Reasoning) [L] [N]

Background Information:

At this Stage it is appropriate to link the understanding of area to multiplication and skip counting.

Mathematics • Stage 2

Measurement and Geometry
Area 2

Outcomes
A student:
2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas
2.7 calculates lengths, areas, volumes, capacities and masses using formal units

Students:

Compare objects using familiar metric units of area and volume

- recognise the need for the square centimetre as a formal unit for measuring area
- use a 10 cm × 10 cm tile (or grid) to find areas that are less than, greater than or about the same as 100 square centimetres [N]
  - discuss strategies used to estimate area in square centimetres or square metres, eg visualising repeated units (Fluency, Understanding) [N] [CCT]
- measure a variety of surfaces using a square centimetre grid overlay [N]
- estimate, measure and compare areas in square centimetres [N]
- use efficient strategies for counting large numbers of square centimetres [N], eg using strips of ten or squares of 100
- record area in square centimetres, eg 55 square centimetres
- recognise the need for a unit larger than a square centimetre
- construct a square metre
  - explain where square metres are used for measuring in everyday situations, eg floor coverings (Understanding) [CCT]
- estimate, measure and compare areas in square metres [N]
- record area in square metres, eg 5 square metres
- use the abbreviations for square metre (m^2) and square centimetre (cm^2) [L]

Background Information:

At this Stage, students should appreciate that a formal unit allows for easier and more accurate communication of area measures. Measurement experiences should enable students to develop an understanding of the size of units, select the appropriate unit, and estimate and measure using the unit. An important understanding at this Stage is that an area of one square metre need not be a square. It could, for example, be a rectangle, two metres long and half a metre wide.

Language:

The abbreviation m^2 is read ‘square metre(s)’ and not ‘metre squared’ or ‘metre square’.

The abbreviation cm^2 is read ‘square centimetre(s)’ and not ‘centimetre squared’ or ‘centimetre square’.

Mathematics • Stage 2

Measurement and Geometry
Volume and Capacity 1

Outcomes
A student:
2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas
2.3 explains the reasoning used to check the accuracy of a statement
2.7 calculates lengths, areas, volumes, capacities and masses using formal units

Students:

Measure, order and compare objects using familiar metric units of length, mass and capacity

- recognise the need for formal units to measure volume and capacity
- estimate, measure and compare volumes and capacities (to the nearest litre) [N]
  - estimate the number of cups needed to fill a container with a capacity of one litre (Fluency) [N]
- use the abbreviation for litre (L) [L]
  - recognise that one litre containers can be a variety of shapes (Understanding)
  - relate the litre to familiar everyday containers, eg milk cartons (Understanding) [CCT]
- recognise the advantages of using a cube as a unit when packing or stacking
- pack small containers with cubic centimetre blocks and describe packing in terms of layers, eg '2 layers of 10 cubic centimetre blocks' [N]
- use the cubic centimetre as a formal unit for measuring volume
- use the abbreviation for cubic centimetre (cm^3) [L]
  - distinguish between mass and volume, eg 'This stone is heavier than the ball but it takes up less room' (Understanding, Reasoning) [N] [CCT]
- construct three-dimensional objects using cubic centimetre blocks and counting to determine volume [N]
- interpret information about capacity and volume on commercial packaging [L]
- estimate the volume of a substance in a partially filled container from the information on the label detailing the contents of the container [N]

Background Information:

At this Stage, students should appreciate that a formal unit allows for easier and more accurate communication of measures and are introduced to the litre, cubic centimetre and millilitre.

Measurement experiences should enable students to develop an understanding of the size of the unit, estimate and measure using the unit, and select the appropriate unit and measuring device.

Fluids are commonly measured in litres and millilitres. Hence the capacities of containers used to hold fluids are usually measured in litres and millilitres, eg a litre of milk will fill a container whose capacity is 1 litre.

The *cubic centimetre* can be introduced and related to the *centimetre* as a unit to measure length and the *square centimetre* as a unit to measure area.

Mathematics • Stage 2

Measurement and Geometry
Volume and Capacity 1

Language:

The abbreviation cm^3 is read ‘cubic centimetre(s)’ and not ‘centimetre cubed’.

Mathematics • Stage 2

Measurement and Geometry
Volume and Capacity 2

Outcomes
A student:
2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas
2.7 calculates lengths, areas, volumes, capacities and masses using formal units

Students:

Compare objects using familiar metric units of area and volume

- compare the volumes of two or more objects by marking the change in water level when each is submerged in a container [N]
  - explain an estimate of the change in water level expected when an object is submerged (Understanding) [N] [CCT]
- recognise the need for a unit smaller than the litre
  - explain the need for a standard unit to measure the volume of liquids and the capacity of containers (Understanding, Reasoning) [CCT]
- estimate, measure and compare volumes and capacities using millilitres to the nearest 100 mL and/or the nearest 10 mL [N] [CCT]

Use scaled instruments to measure and compare lengths, masses, capacities and temperatures

- make a measuring device calibrated in multiples of 100 millilitres [CCT] [N]
- use a measuring device calibrated in millilitres,
  eg medicine glass, measuring cylinder to compare capacities [CCT]
  - relate the millilitre to familiar everyday containers and familiar informal units, eg 1 teaspoon is approximately 5 mL, 250 mL fruit juice containers, etc (Understanding) [N] [CCT]
- measure the overflow in millilitres when different objects are submerged in a container filled to the brim with water
- use the abbreviation for millilitre (mL) [L]
- recognise that 1000 millilitres equal one litre [N]
- convert between millilitres and litres, eg 1250 mL = 1 litre 250 millilitres [N]
- recognise a thermometer as a measuring device and read temperatures to the nearest degree [L] [N]

Mathematics • Stage 2

Measurement and Geometry

Volume and Capacity 2

Background Information:

Measurement experiences should enable students to develop an understanding of the size of the unit, estimate and measure using the unit, and select the appropriate unit and measuring device.

Fluids are commonly measured in litres and millilitres. Hence the capacities of containers used to hold fluids are usually measured in litres and millilitres, eg a litre of milk will fill a container whose capacity is 1 litre.

The displacement strategy for finding the volume of an object relies on the fact that an object displaces its own volume when it is totally submerged in a liquid. The strategy may be applied in two ways: using a partially filled, calibrated, clear container and noting the change in the level of the liquid when the object is submerged, or submerging an object into a container filled to the brim with liquid and measuring the overflow.

Mathematics • Stage 2

Measurement and Geometry
Mass 1

Outcomes
A student:
2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas
2.3 explains the reasoning used to check the accuracy of a statement
2.7 calculates lengths, areas, volumes, capacities and masses using formal units

Students:

Measure, order and compare objects using familiar metric units of length, mass and capacity

- recognise the need for a formal unit to measure mass
- use the abbreviation for kilogram (kg) [L]
- use the kilogram as a unit to measure mass [N]
  - recognise that objects with a mass of one kilogram can be a variety of shapes and sizes (Understanding) [N] [CCT]
- use hefting to identify objects that are 'more than', 'less than' and 'about the same as' one kilogram [N] [CCT]
  - discuss strategies used to estimate mass, eg by referring to a known mass (Fluency, Understanding) [N] [CCT]
- estimate and check the number of similar objects that have a total mass of one kilogram [N]
  - explain why two students may obtain different measures for the same mass (Understanding, Reasoning) [N] [CCT]
- recognise the need for a unit smaller than the kilogram
- use the abbreviation for grams (g) [L]

Background Information:

At this Stage, students should appreciate that a formal unit allows for easier and more accurate communication of mass measures and are introduced to the kilogram and gram. Students should develop an understanding of the size of these units, and estimate and measure using the units.

Mathematics • Stage 2

Measurement and Geometry
Mass 2

Outcomes
A student:
2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas
2.2 selects and uses appropriate mental, written or technological strategies to solve problems
2.7 calculates lengths, areas, volumes, capacities and masses using formal units

Students:

Use scaled instruments to measure and compare lengths, masses, capacities and temperatures

- measure the mass of an object in kilograms using an equal arm balance [N]
- measure and compare the masses of objects in kilograms and grams using a set of scales [N]
  - interpret statements, and discuss the use of grams and kilograms, on commercial packaging (Understanding) [L] [CCT]
- recognise that 1000 grams equal one kilogram [N]
- measure, compare and record masses of objects using a set of scales [N]
- interpret commonly used fractions of a kilogram including $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$ and relating these to the number of grams [N]
  - solve problems including those involving commonly used fractions of a kilogram (Problem Solving) [N] [CCT]

Background Information:

Refer to background information in Mass 1

Language:

The term ‘scale’ as in a set of scales may be confusing for some students who confuse it with other uses of the word ‘scales’, eg fish scales, snake scales, scales on a map, musical scales. These other meanings should be discussed with all students.

Mathematics • Stage 2

Measurement and Geometry
Time 1

Outcome
2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas
2.8 reads, records and compares time in one-minute intervals and converts between time units

Students:

Tell time to the minute and investigate the relationship between units of time

- recognise the coordinated movements of the hands on an analog clock, including; [N]
  - how many minutes it takes for the minute hand to move from one numeral to the next
  - how many minutes it takes for the minute hand to complete one revolution
  - how many minutes it takes for the hour hand to move from one numeral to the next
  - how many minutes it takes for the minute hand to move from the twelve to any other numeral
  - how many seconds it takes for the second hand to complete one revolution
- read analog and digital clocks to the minute [L] [N],
  eg 7:35 is read as 'seven thirty-five' or twenty five to eight
- discuss time using appropriate language [L] [N]
- record in words various times as shown on analog and digital clocks [L] [N]

Background Information:

Discuss with students the use of informal units of time and their use in other cultures.

A solar year actually lasts 365 days 5 hours 48 minutes and 45.7 seconds.

Mathematics • Stage 2

Measurement and Geometry

Time 2

Outcomes

A student:

2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas
2.2 selects and uses appropriate mental, written or technological strategies to solve problems
2.3 explains the reasoning used to check the accuracy of a statement
2.8 reads, records and compares time in one-minute intervals and converts between time units

Students:

Convert between units of time

- convert between units of time,
  eg 60 seconds = 1 minute, 60 minutes, = 1 hour, 24 hours = 1 day [N]
- recall time facts,
  eg 24 hours in a day
  - compare and discuss the relationship between time units, eg an hour is a longer time than a minute (Reasoning, Understanding) [N] [CCT]

Use am and pm notation and solve simple time problems

- record digital time using the correct notation [L] [N],
  eg 9:15
- relate analog notation to digital notation [N] [CCT],
  eg ten to nine is the same as 8:50
  - solve a variety of time problems using a variety of strategies (Problem Solving) [N] [CCT]
- read and interpret simple timetables, timelines and calendars [N] [L] [CCT] [PSC]

Background Information:

See background information in Time 1

Language:

In Latin am is ‘ante meridiem’ meaning before midday in English. In Latin pm is ‘post meridiem’ meaning post midday in English

Mathematics • Stage 2

Measurement and Geometry
Three-Dimensional Space 1

Outcomes
A student:
2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas
2.3 explains the reasoning used to check the accuracy of a statement
2.9 makes and compares three-dimensional objects, identifies two-dimensional shapes and angles, and uses simple maps and plans

Students:

Make models of three-dimensional objects and describe key features

- compare and describe features of prisms, pyramids, cylinders, cones and spheres [L] [N]
  - compare features of three-dimensional objects and two-dimensional shapes (Reasoning) [CCT]
- identify and name three-dimensional objects as prisms, pyramids, cylinders, cones and spheres [L]
  - recognise and describe the use of three-dimensional objects in a variety of contexts, eg buildings, packaging (Understanding) [CCT]
- recognise similarities and differences between prisms, pyramids, cylinders, cones and spheres [N]
- make models of prisms, pyramids, cylinders, cones and spheres given a three-dimensional object, picture or photograph to view [CCT]
- create nets from everyday packages,
  eg a cereal box
  - make and describe the variety of nets that can be used to create particular three-dimensional objects (Fluency, Understanding)
- make and visualise the resulting cut face (plane section) when a three-dimensional object receives a straight cut [N] [CCT]
- recognise that prisms have a uniform cross-section when the section is parallel to the base
- recognise that pyramids do not have a uniform cross-section

Mathematics • Stage 2

Measurement and Geometry

Three-Dimensional Space 1

Background Information:

The formal names for particular prisms and pyramids are not introduced at this Stage. Prisms and pyramids are to be treated as classes to group all prisms and all pyramids. Names for particular prisms or pyramids are introduced in Stage 3.

Prisms have two bases that are the same shape and size. The bases of a prism may be squares, rectangles, triangles or other polygons. The other faces in the net are rectangular if the faces are perpendicular to the base. The base of a prism is the shape of the uniform cross-section, not necessarily the face on which it is resting.

Pyramids differ from prisms in that they have only one base and all the other faces are triangular. The triangular faces meet at a common vertex.

A section is a representation of an object as it would appear if cut by a plane, eg if the corner was cut off a cube, the resulting cut face would be a triangle. An important understanding at this Stage is that the cross-sections parallel to the base of prisms are uniform and the cross-sections parallel to the base of pyramids are not. Students could explore these ideas by stacking uniform objects to model prisms, and stacking sets of seriated shapes to model pyramids. (Note: such stacks are not strictly pyramids but assist understanding),

eg

In Geometry a three-dimensional object is called a solid. The three-dimensional object may in fact be hollow but it is still defined as a geometrical solid. Models at this Stage should include skeletal models.

Mathematics • Stage 2

Measurement and Geometry

Three-Dimensional Space 2

Outcomes

A student:

2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas

2.3 explains the reasoning used to check the accuracy of a statement

2.9 makes and compares three-dimensional objects, identifies two-dimensional shapes and angles, and uses simple maps and plans

Students:

Represent and investigate three-dimensional objects in drawings

- identify three-dimensional objects in the environment and from drawings, photographs or descriptions [N]
- sketch prisms, pyramids, cylinders and cones, attempting to show depth [CCT]
  - compare own drawings of three-dimensional objects with other drawings and photographs of three-dimensional objects (Reasoning) [CCT]
  - draw three-dimensional objects using a computer drawing tool, attempting to show depth (Fluency) [CCT] [ICT]
- sketch three-dimensional objects from different views including top, front and side views [CCT]
  - identify and name a three-dimensional object from drawings of its faces (Understanding)

Background Information:

Refer to background information in Three-Dimensional Space 1

Mathematics • Stage 2

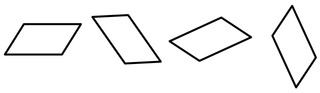
Measurement and Geometry
Two-Dimensional Space 1

Outcomes
A student:
2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas
2.3 explains the reasoning used to check the accuracy of a statement
2.9 makes and compares three-dimensional objects, identifies two-dimensional shapes and angles, and uses simple maps and plans

Students:

Investigate two-dimensional shapes

- manipulate, compare and describe features of two-dimensional shapes, including pentagons, octagons and parallelograms [L]
- identify and name pentagons, octagons, and parallelograms presented in different orientations eg



[L] [N]

- compare and describe the features of special groups of quadrilaterals [N] [CCT]
- use measurement to describe features of two-dimensional shapes [N], eg the opposite sides of a parallelogram are the same length
- group two-dimensional shapes using multiple attributes [N], eg those with parallel sides and right angles
  - explain why a particular two-dimensional shape has a given name, eg 'It has four sides, and the opposite sides are parallel' (Reasoning) [CCT]
- construct two-dimensional shapes from a variety of materials [CCT], eg cardboard, straws and connectors
  - determine that a triangle cannot be constructed from three straws if the sum of the lengths of the two shortest straws is less than the longest straw (Reasoning)
- compare the rigidity of two-dimensional frames of three sides with those of four or more sides
  - explain why a four-sided frame is not rigid (Reasoning) [CCT]

Identify symmetry in the environment

- find lines of symmetry for a given shape
  - explain why any line through the centre of a circle is a line of symmetry (Reasoning)

Identify angles as measures of turn and compare angle sizes in everyday situations

- identify and name perpendicular lines [L]
- identify angles with two arms in practical situations [N], eg corners
  - identify examples of angles in the environment and as corners of two-dimensional shapes (Understanding) [N] [CCT]

Mathematics • Stage 2

Measurement and Geometry
Two-Dimensional Space 1

- identify angles in two-dimensional shapes and three-dimensional objects [N]
- identify the arms and vertex of the angle in an opening, a slope and a turn where one arm is visible,
  eg the bottom of a door when it is open is the visible arm and the imaginary line at the base of the doorway is the other arm [N]

Background Information:

It is important for students to experience a variety of shapes in order to develop flexible mental images. Students need to be able to recognise shapes presented in different orientations. In addition, they should have experiences identifying both regular and irregular shapes. Regular shapes have all sides equal and all angles equal.

When constructing polygons using materials such as straws of different lengths for sides, students should be guided to an understanding that: sometimes a triangle cannot be made from 3 straws, a shape made from three lengths, ie a triangle, is always flat, a shape made from four or more lengths need not be flat, a unique triangle is formed if given three lengths, more than one two-dimensional shape will result if more than three lengths are used.

At this Stage, students need informal experiences of creating, identifying and describing a range of angles. This will lead to an appreciation of the need for a formal unit to measure angles which is introduced in Stage 3.

The use of informal terms 'sharp' and 'blunt' to describe acute and obtuse angles respectively are actually counterproductive in identifying the nature of angles as they focus students' attention to the external points of the angle rather than the amount of turning between the angle arms.

A simple angle tester can be created by cutting the radii of two equal circles and sliding the cuts together. Another can be made by joining two narrow straight pieces of card with a split-pin to form the rotatable arms of an angle.

Language:

It is actually the angles that are the focus for the general naming system used for shapes. A polygon (Greek 'many angles') is a closed shape with three or more angles and sides.

Quadrilateral is a term used to describe all four-sided figures.

Mathematics • Stage 2

Measurement and Geometry

Two-Dimensional Space 2

Outcomes

A student:

2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas

2.3 explains the reasoning used to check the accuracy of a statement

2.9 makes and compares three-dimensional objects, identifies two-dimensional shapes and angles, and uses simple maps and plans

Students:

Compare and describe two dimensional shapes that result from combining and splitting common shapes, with and without the use of digital technologies

- create and combine simple shapes using computer software and describe the resulting shape [CCT] [ICT]
- identify common two-dimensional shapes that are part of a composite shape by recreating it from these shapes
- make representations of two-dimensional shapes in different orientations [N]
  - recognise that a particular shape can be represented in different sizes and orientations (Understanding)

Create symmetrical patterns, pictures and shapes with and without digital technologies

- make tessellating designs by reflecting (flipping), translating (sliding) and rotating (turning) a two-dimensional shape [CCT]
  - use computer drawing tools to create a tessellating design by copying, pasting and rotating regular shapes (Fluency, Understanding) [CCT] [ICT]
- describe designs in terms of reflecting, translating and rotating [CCT]
- create simple shapes using computer software involving direction and angles [ICT]

Compare angles and classify them as equal to, greater than or less than a right angle

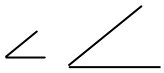
- compare angles using informal means such as an angle tester [CCT]
- describe angles using everyday language and the term ‘right’ to describe the angle formed when perpendicular lines meet [L]
  - explain why a given angle is, or is not, a right angle (Reasoning) [CCT]
- draw angles of various sizes by tracing along the adjacent sides of shapes and describing the angle drawn

Mathematics • Stage 2

Measurement and Geometry
Two-Dimensional Space 2

Background Information:

Paper folding is a quick and simple means of generating a wide range of angles for comparison and copying.



The arms of these angles are different lengths. However, the angles are the same size as the amount of turning between the arms is the same. Students may mistakenly judge an angle to be greater in size than another on the basis of the length of the arms of the angles in the diagram.

Language:

Polygons are named according to the number of angles, eg pentagons have five angles, hexagons have six angles, and octagons have eight angles.

Mathematics • Stage 2

Measurement and Geometry
Position 1

Outcomes
A student:
2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas
2.9 makes and compares three-dimensional objects, identifies two-dimensional shapes and angles, and uses simple maps and plans

Students:

Create and interpret simple grid maps to show position and pathways

- describe the location of an object using more than one descriptor, eg 'The book is on the third shelf and second from the left.' [L]
- construct simple maps and plans using a grid overlay [CCT], eg map of their bedroom
  - create a simple map or plan using computer paint, draw and graphics tools (Understanding, Fluency) [CCT] [ICT]
- draw and describe a path or route on a simple map or plan
  - use computer software involving maps, position and paths (Fluency, Understanding) [CCT] [ICT]
  - discuss the use of grids in the environment, eg zoo map, map of shopping centre (Understanding) [CCT] [L]
- interpret and use simple maps found in factual texts and in the media [L]
- draw maps and plans from an aerial view [CCT]

Background Information:

Grids are used in many contexts to identify position. Students could create their own simple maps and, by drawing a grid over the map, they can then describe locations.

Mathematics • Stage 2

Measurement and Geometry
Position 2

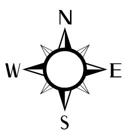
Outcomes
A student:

2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas
2.9 makes and compares three-dimensional objects, identifies two-dimensional shapes and angles, and uses simple maps and plans

Students:

Use simple scales, legends and directions to interpret information contained in basic maps

- use a key or legend to locate specific objects [CCT] [N]
- use given directions to follow a route on a simple map [N]
  - use and follow positional and directional language (Understanding) [L] [N]
- use coordinates on simple maps to describe position [L],
  eg ‘The lion cage is at B3.’
  - use simple coordinates in games, including simulation software (Fluency) [ICT] [N]
- plot points at given coordinates [N]
- use a compass to find North and hence East, South and West
- use an arrow to represent North on a map
- determine the directions N, S, E and W, given one of the directions
- use N, S, E and W to describe the location of an object on a simple map, given an arrow that represents North,
  eg ‘The treasure is east of the cave.’[L]
- use a compass rose to indicate each of the key directions,

  eg 

- determine the directions NE, NW, SE and SW, given one of the directions [N]
- use NE, NW, SE and SW to describe the location of an object on a simple map, given a compass rose,
  eg ‘The treasure is north-east of the cave.’ [L] [N]
- use scale to calculate the distance between two points on a map [N]
  - interpret scales on maps and plans (Understanding) [L] [N]
  - give reasons for using a particular scale on a map or plan (Reasoning) [CCT] [N]

Mathematics • Stage 2

Measurement and Geometry

Position 2

Background Information:

At this Stage, a range of mapping skills could be further developed that include the interpretation of scales and simple calculations to find the actual distance between locations on a map.

Students need to have experiences identifying North from a compass in their own environment and then determining the other three directions, East, West and South.

This could be done in the playground before introducing students to using these directions on maps to describe the positions of various places.

The four directions NE, NW, SE and SW could then be introduced to assist with descriptions of places that lie between N, S, E or W.

Mathematics • Stage 2

Statistics and probability
Data 1

Outcomes
A student:
2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas
2.2 selects and uses appropriate mental, written or technological strategies to solve problems
2.10 selects effective data collection methods, and constructs, compares and interprets data displays

Students:

Identify questions or issues for categorical variables. Identify data sources and plan methods of data collection and recording

- conduct surveys to collect data
  - pose questions that can be answered using the information from a table or graph (Understanding) [CCT]
- create a list of categories for data collection [CCT], eg 'Which is the most popular breakfast cereal in our class?'
  - investigate varying results for lists of categories using ICT, eg collect data on the same question with students in another school, state or country (Problem solving) [L] [CCT] [ICT]
  - identify issues for data collection and refine investigations, eg what if students don't eat cereal? (Problem Solving) [CCT]

Collect data, organise into categories and create displays using lists, tables, picture graphs and simple column graphs, with and without the use of digital technologies

- collect data and create a simple table to organise the data [N] [L] [CCT], eg collect data on the quantity of each colour of lollies in a packet

Red	Blue	Yellow	Green
5	2	7	1

  - create a table to organise collected data, using computer software, eg spreadsheets (Fluency) [N] [ICT]
- construct vertical and horizontal column graphs and picture graphs on grid paper using one-to-one correspondence [N]
  - use simple graphing software to enter data and create a graph (Fluency) [ICT]
- mark equal spaces on axes, labelling axes and naming the display

Interpret and compare data displays

- interpret information presented in simple tables [N] [L]
- interpret information presented in column graphs and picture graphs [N] [L]

Mathematics • Stage 2

Statistics and probability
Data 1

Background Information:

Data could be collected from the Internet, newspapers or magazines.

It is important at this Stage to discuss that graphs are used in real world contexts to persuade and/or influence the reader, and are often biased.

Language:

See Language for Data 1 in Stage 1

Mathematics • Stage 2

Statistics and Probability

Data 2

Outcomes

A student:

2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas

2.2 selects and uses appropriate mental, written or technological strategies to solve problems

2.10 selects effective data collection methods, and constructs, compares and interprets data displays

Students:

Select and trial methods for data collection, including survey questions and recording sheets

- pose a suitable question to be answered using a survey [CCT],
  eg 'What is the most popular playground game among students in our class?'
- compare the effectiveness of different methods of collecting data [CCT],
  eg creating categories of playground games and use tally marks, compared to open-ended questions like 'What playground game do you like to play?'
- choose the most effective way to collect data for an investigation [CCT],
  eg creating a survey with a scale of 1 to 5 to indicate preferences (1- don't like, 2- likes a little, 3- don't know, 4- likes, 5- likes a lot) (Problem Solving)

Construct suitable data displays, with and without the use of digital technologies, from given or collected data. Include tables, column graphs and picture graphs where one picture can represent many data values

- represent the same data in more than one way [N],
  eg tables, column graphs, picture graphs
- create a two-way table to organise data [N] [L],

  eg

Drinks	Boys	Girls
Milk	5	6
Water	3	2
Juice	2	1

- interpret information presented in two-way tables [N] [L]

Evaluate the effectiveness of different displays in illustrating data features including variability

- interpret and evaluate the effectiveness of data displays found on the Internet, in media and in factual texts [L] [CCT],
  eg identify and discuss misleading representations of data
- discuss the advantages and disadvantages of different representations of the same data [CCT],
  eg two-way tables in comparison to visual displays such as column graphs

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Background Information:

Refer to background information in Data 1

Mathematics • Stage 2

Statistics and Probability

Data 2

Language:

Refer to language in Data 1

Mathematics • Stage 2

Statistics and Probability
Chance 1

Outcomes
A student:
2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas
2.11 describes and compares chance events in social and experimental contexts

Students:

Conduct chance experiments, identify and describe possible outcomes and recognise variation in results

- list all the possible outcomes in a simple chance situation, eg ‘heads’, ‘tails’ if a coin is tossed [N]
- predict and record all possible outcomes in a simple chance experiment [CCT], eg randomly selecting three pegs from a bag containing an equal number of pegs of two colours
  - explain the differences between expected results and actual results in a simple chance experiment (Understanding) [CCT]
- use the language of chance in everyday contexts, eg a fifty-fifty chance, a one in two chance [N]
- predict and record all possible combinations, eg the number combinations when rolling two dice [CCT]

Background Information:

When a fair coin is tossed, theoretically there is an equal chance of a head or tail. If the coin is tossed and there are five heads in a row there is still an equal chance of a head or tail on the next toss, since each toss is an independent event.

Mathematics • Stage 2

Statistics and Probability
Chance 2

Outcomes
A student:
2.1 uses appropriate terminology and symbols to describe and represent mathematical ideas
2.3 explains the reasoning used to check the accuracy of a statement
2.11 describes and compares chance events in social and experimental contexts

Students:

Describe possible everyday events and order their chances of occurring

- distinguish between certain and uncertain events [N]
- compare familiar events and describing them as being equally likely or more or less likely to occur [N]
- order events from least likely to most likely [N],
  eg 'having ten children away sick on the one day is less likely than having one or two away'

Identify everyday events where one cannot happen if the other happens

- discuss everyday events that cannot occur at the same time [N],
  eg when tossing one coin, you can only throw a head or a tail not both at the same time
- compare the likelihood of outcomes in a simple chance experiment [N],
  eg from a collection of 27 red, 10 blue and 13 yellow marbles, name red as being the colour most likely to be drawn out and identify that it is impossible to draw out a green marble

Identify events where the chance of one will not be affected by the occurrence of the other

- conduct simple experiments with random generators including coins, dice and spinners, discussing and recording the outcomes,
  eg roll a die fifty times, keep a tally and graph the result
  - explain why the probability of a second toss of a coin does not depend on the result of the first, whereas drawing a card from a pack of playing cards and not returning it to the pack changes the probability of future cards drawn (Understanding) [N] [CCT]
- conduct simple experiments where the probability of the outcomes is not equal,
  eg spin a spinner twenty times, where the quantity of each number is unequal, predict, record and discuss the results
  - discuss the 'fairness' of simple games involving chance (Understanding, Reasoning) [N] [CCT]
  - make statements that acknowledge 'randomness' in a situation, eg 'the spinner could stop on any colour' (Understanding, Reasoning) [CCT]

Background Information:

Refer to background information in Chance 1